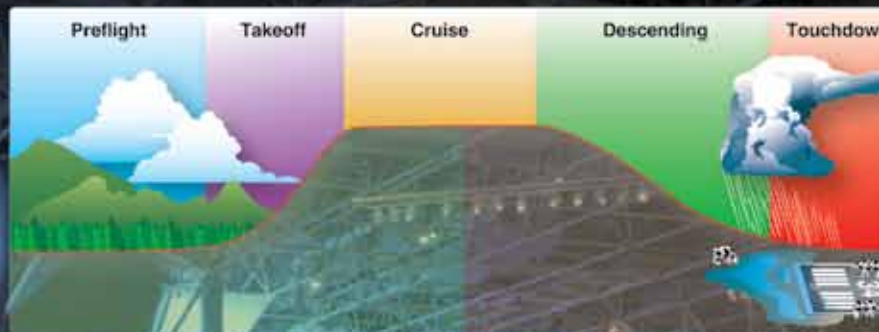


## Chapter 6

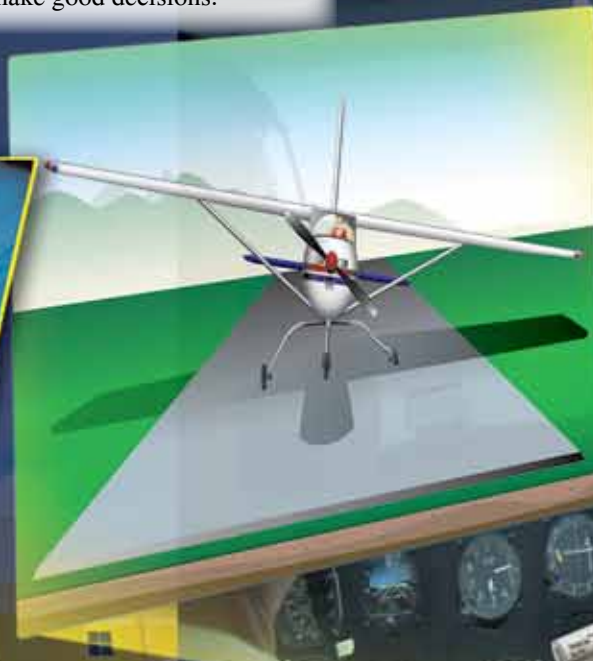
# Single-Pilot Resource Management

### Introduction

While crew resource management (CRM) focuses on pilots operating in crew environments, many of the concepts apply to single pilot operations. Many CRM principles have been successfully applied to single-pilot aircraft and led to the development of single-pilot resource management (SRM). SRM is defined as the art of managing all the resources (both onboard the aircraft and from outside sources) available to a pilot prior to and during flight to ensure a successful flight. SRM includes the concepts of aeronautical decision-making (ADM), risk management, controlled flight into terrain (CFIT) awareness, and situational awareness. SRM training helps the pilot maintain situational awareness by managing automation, associated aircraft control, and navigation tasks. This enables the pilot to accurately assess hazards, manage resulting risk potential, and make good decisions.



Advanced System



SRM helps pilots learn to execute methods of gathering information, analyzing it, and making decisions. Although the flight is coordinated by a single person and not an onboard flightcrew, the use of available resources, such as air traffic control (ATC) and automated flight service stations (AFSS), replicates the principles of CRM.

## Recognition of Hazards

As will be seen in the following accident, it is often difficult for the pilot involved to recognize a hazard and understand the risk. How a pilot interprets hazards is an important component of risk assessment. Failure to recognize a hazard becomes a fatal mistake in the following accident involving an experimental airplane.

During a cross-country night flight, an experimental airplane experienced an inflight fire followed by a loss of control. The aircraft hit a building and both the commercial pilot and the private pilot-rated passenger were killed. There were no injuries to anyone on the ground. Night visual meteorological conditions prevailed at the time. The flight departed from its home airport about 20:00. The experimental four-place, four-door, high-wing airplane had a composite fuselage powered by a Lycoming IO-360 engine. The aircraft had logged 94.1 hours.

At the time, the flight was transitioning through Class B airspace and receiving visual flight rules (VFR) advisories from Approach Control. According to the facility transcript, at 20:33:36 the pilot queried the controller about a fire smell and asked if there were fire activity in the marshland below them. The controller indicated in the negative, to which the pilot responded, “We just want know if it’s the airplane that smells or the air.” [Figure 6-1]

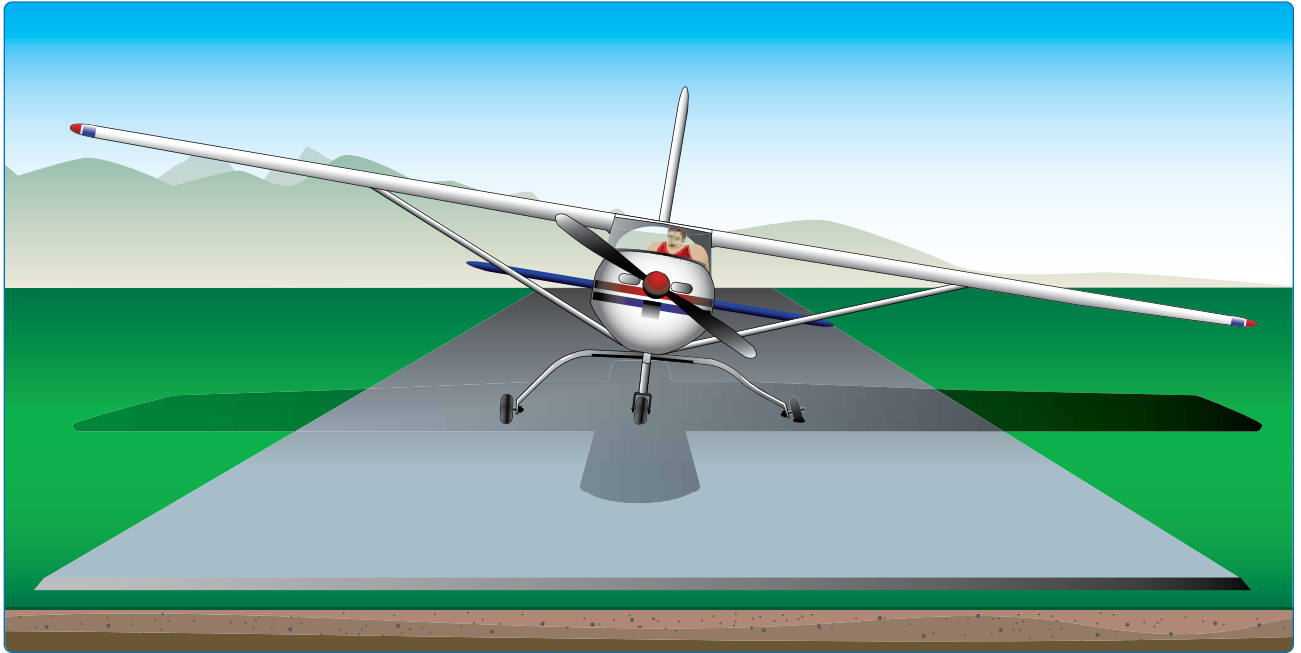
Shortly afterward, the pilot was advised of a frequency change, which was acknowledged. At 20:36:06, the pilot checked in with another controller and was given the current altimeter setting. A little more than 1½ minutes later, the controller transmitted that he was not receiving the airplane’s Mode C transponder altitude, to which there was no response from the pilot. All communications with the aircraft were lost.

Radar data indicated that when the pilot queried the controller about a fire, the airplane was at 5,500 feet mean sea level (MSL) heading north. The airplane’s radar track continued northbound until 20:37:13, at which time the last transponder return from the airplane was recorded. The remainder of the radar track (primary targets only) showed the airplane turning right to a heading of east-southeast. At about 20:39:20, the airplane turned further right to a heading of south. The last



**Figure 6-1.** The pilot perceived something was wrong (see Chapter 5, Aeronautical Decision-Making) but failed to process the information correctly.





**Figure 6-2.** *The pilot must consider all aspects of the flight to include form, fit, and function.*

radar return was received at 20:39:36. Three minutes later, the controllers were notified by police that an airplane had crashed into a building.

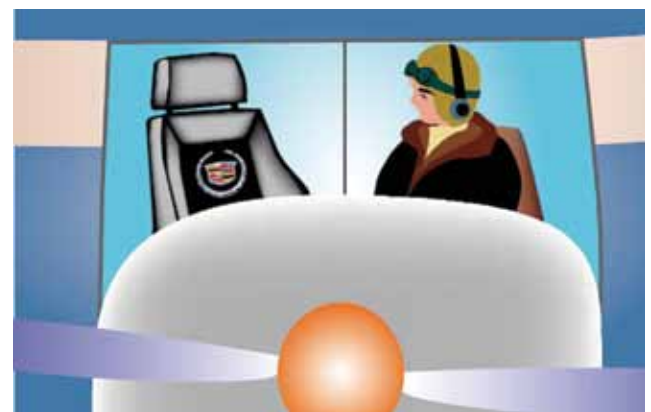
One witness reported that the airplane was flying at an altitude of about 500 feet above ground level (AGL) in a southeast direction when it made “a slight right turn, then a slight left turn, then a sharp right turn, then descended in what appeared to be in excess of 30° nose down.” A second witness observed the airplane at an altitude of less than 100 feet AGL “in an excessive nose-down attitude towards the ground.” Both witnesses reported that a large post-impact fire erupted.

The pilot, seated in the right front seat, held a commercial pilot certificate with airplane single- and multi-engine land and instrument ratings. Additionally, he held a flight instructor certificate with airplane single-engine land and instrument airplane ratings. According to Federal Aviation Administration (FAA) records, the pilot had accumulated a total flight time of over 1,400 hours. The passenger, who was seated in the left front seat, held a private pilot certificate with an airplane single-engine land rating. Records indicated the passenger was 6 feet 3 inches tall and weighed 231 pounds. [Figure 6-2]

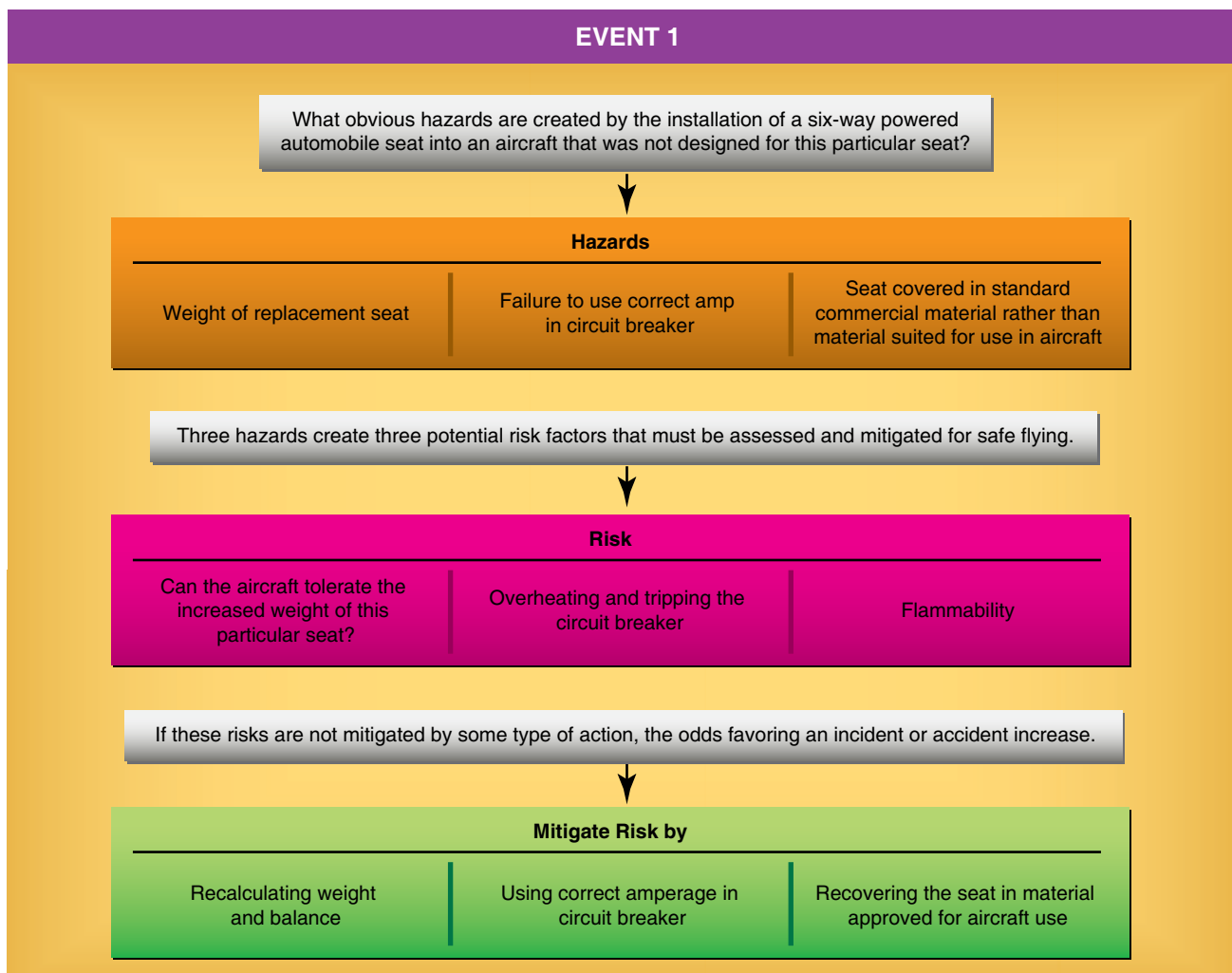
The airplane was constructed by its manufacturer as a prototype for an experimental amateur-built kit and was issued a special airworthiness certificate in the category of experimental research and development. Material examination of the engine and propeller indicated no pre-accident discrepancies, and all major structures were

accounted for. It was not possible to assess control continuity due to impact and subsequent fire.

Upon interview, representatives of the manufacturer indicated that the original pilot (left) seat in the airplane was replaced by the owner about a month prior to the accident with a six-way power seat from an automobile. [Figure 6-3] It was installed to accommodate customer requests for an adjustable seat. This seat incorporated three motors that facilitated the six-way movement of the seat. In its original automotive installation, it was wired using a 30-amp circuit breaker for protection; if any motor failed, the automobile circuit would trip. As installed in the automobile, if the breaker did not trip, the switch itself would fail. The seat was installed in the airplane with a 5-amp circuit breaker, but shortly after



**Figure 6-3.** *This pilot simply wanted to be comfortable while flying.*



**Figure 6-4.** Example of an event diagram mapping hazards, risk assessment, and risk mitigation for the first event.

installation, it was noted that a larger person in the left seat would trip the circuit breaker and the motors became hot. The 5-amp circuit breaker was replaced with a 7-amp circuit breaker to prevent excessive tripping.

The event diagram in *Figures 6-4* and *6-5* maps the hazards, risk assessment, and attempts to mitigate this accident.

As this accident demonstrates, for the pilot of an experimental aircraft, assessing risk goes beyond the self-assessment illustrated in the IMSAFE method. Hazard identification, risk assessment, and its mitigation starts much earlier. The construction method of manufacture and the materials used impose a certain inherent risk that may not be apparent until an adverse event occurs. Unfortunately, hindsight is of limited value to the aircraft passengers and pilot, but do provide others a better understanding of risk and its insidious nature.

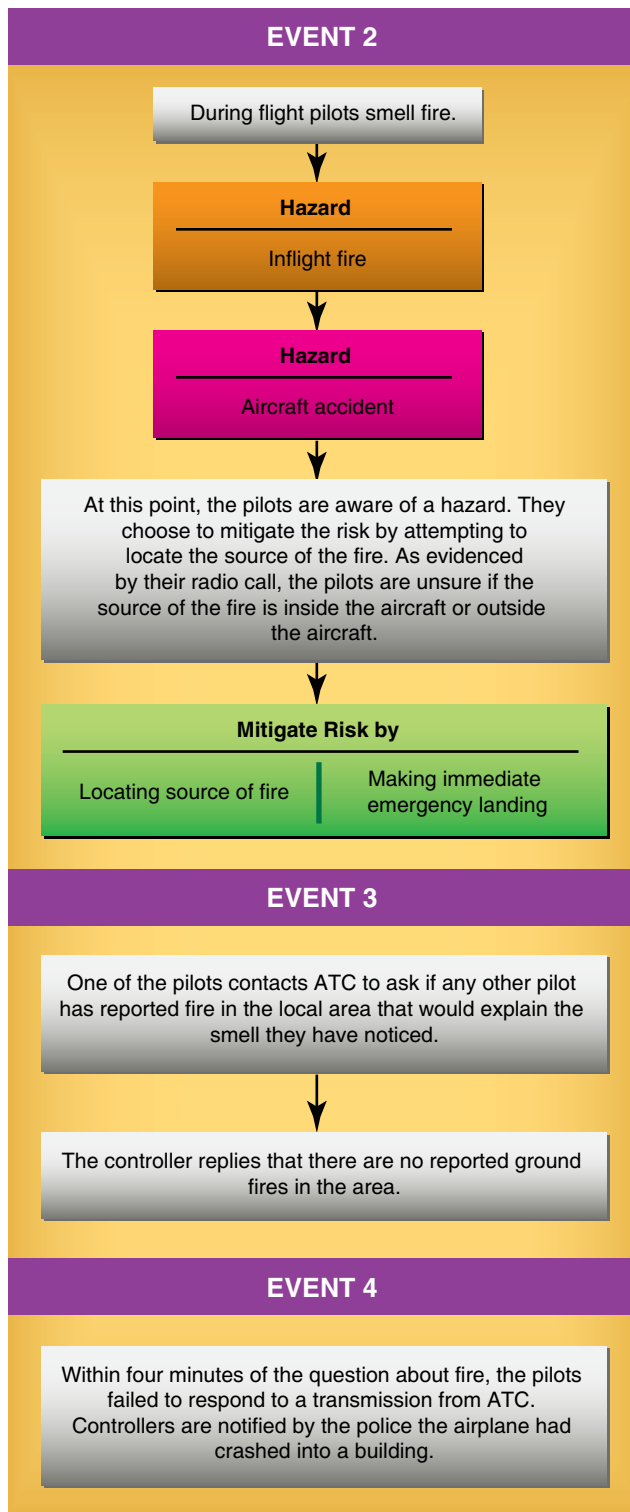
The risk assessment matrix in *Figure 6-6* can provide lessons from this accident. The vertical scale relates to the likelihood

of something happening, while the horizontal scale indicates impact upon safety of the flight.

While impact damage precluded the National Transportation Safety Board (NTSB) from determining the cause of the fire for the aircraft involved in this accident, the final report discusses the possibility that one of the motors to the seat overheated and ignited the seat cushion. They attributed this possibility to the circuit breaker issue as well as the past instance of the circuit breaker tripping when a large occupant sat in the seat.

It is probable that the installation of the replacement seat started a chain of events diagramed above that led to a fatal accident. The three hazards associated with the seat are discussed more fully below:

1. Effect of weight on the aircraft weight and balance and its downstream performance—a seat with three motors adds significant weight on one side to the aircraft.



**Figure 6-5.** Event diagram for events 2 through 4.

Even with weight allowances, aircraft performance would be affected.

2. Seat materials—the criteria for automobile materials are different from those for materials suitable for use

Risk Assessment Matrix				
Likelihood	Severity			
	Catastrophic	Critical	Marginal	Negligible
	Probable	High	High	Serious
	Occasional	High	Serious	
	Remote	Serious	Medium	Low
	Improbable			

**Figure 6-6.** The installation of non-aviation parts can have a profound effect.

in aircraft. Material coverings certified for aircraft use provide additional safety and are intended to reduce unnecessary exposure to fire. In this accident, the possibility exists that the seat covering on the automotive seat exacerbated the fire.

3. Potential for electrical malfunctions, especially overheating—why use a 5-amp and then a 7-amp circuit breaker when a 30-amp circuit breaker was used in the original automotive installation?

Did the pilot in command (PIC) take unnecessary risk? Assuming he or she had no knowledge of the differences between the replacement seat and a normal aircraft seat, he should have questioned the installation of a non-aircraft part. And, examine the PIC's query to the controller during the flight. He indicated he was not sure if his aircraft were on fire or if something on the ground were on fire. Did he incorrectly assess the information he had been given? Did he assume his aircraft was not on fire? Given the seat's installation, its propensity to overheat, and the indication of a fire, what should the pilot have done?

In *Figure 6-6*, the risk matrix relates directly to both the builder of the aircraft and the PIC.

- Builder—the likelihood of an adverse event is minimized when aviation standards are adopted in both the selection of material and components, and their installation. The more closely the standards are followed, the less likely the occurrence of an adverse event. In this case, the likelihood of an adverse event is maximized not only because of the seat installation, but that it represents a potential problem across the construction of the entire aircraft.
- PIC—if he were familiar with the seat installation, the problems it created, and its prior problem of overheating, he failed to assess the likelihood that the source of the smell was a fire in the aircraft and not a fire on the ground. No information is available

on how long the occupants of the aircraft smelled the smoke, but there were only four minutes between the radio call requesting information about ground fires and the impact with the building. This left the pilot little time to react to a hazard that metamorphosed into a catastrophe.

Rating the likelihood of an impending problem means a pilot needs to ask key questions. For instance, the PIC of this accident needed to ask the aircraft builder how the addition of this seat affected the aircraft. “If this component fails, what are the consequences or severity of the problems it creates?” Obviously, the installation of this seat produced issues in many areas: the seat cover material, electrical loading, weight and balance, and the impact of the added weight upon aircraft performance. Independently, these factors may not create an catastrophic hazard, but taken collectively, they can create a chain of failures that lead to a fatal accident.

The PIC recognized a fire was in evidence while in flight. Given aviation historical data regarding inflight fires, smoke in the flight deck is considered an emergency. In this case, the controller even eliminated one source as a possibility. He told the pilot no ground fires had been reported. Did the PIC fail to take seriously that the smoke must be from his aircraft? Did this pilot make a poor inflight decision or did he make a poor preflight decision?

This example illustrates how an aircraft that is not constructed to standards places the unaware pilot with an element of risk. In 1983, an amateur builder in Alabama used improper wing bolts to secure his homebuilt’s wings. The manufacturer called for the use of eight special close-tolerance high-strength bolts that cost approximately 40 dollars each. The homebuilder found what he decided were the same bolts at his local farm supply center for less than 2 dollars each. Upon takeoff, the bolts sheared at about 15 feet in altitude. Consequently, the aircraft’s wings collapsed, causing permanent disability to the pilot as a result of his injuries. The bolts he used were simple, low-strength material bolts used for wooden gates.

## Use of Resources

To make informed decisions during flight operations, a pilot must also become aware of the resources found inside and outside the flight deck. Since useful tools and sources of information may not always be readily apparent, learning to recognize these resources is an essential part of ADM training. Resources must not only be identified, but a pilot must also develop the skills to evaluate whether there is time to use a particular resource and the impact its use has upon the safety of flight. For example, the assistance of ATC may be very useful if a pilot becomes lost, but in an emergency situation, there may be no time to contact ATC.

During an emergency, a pilot makes an automatic decision and prioritizes accordingly. Calling ATC may take away from time available to solve the problem. Ironically, the pilot who feels the hourglass is running out of sand would be surprised at the actual amount of time available in which to make decisions. The perception of “time flying” or “dragging” is based upon various factors. If the pilot were to repeat the event (in which time seemed to evaporate) but had been briefed on the impending situation and could plan for it, the pilot would not feel the pressure of time “flying.” This example demonstrates the theory that proper training and physiological well-being is critical to pilot safety.

## Internal Resources

One of the most underutilized resources may be the person in the right seat, even if the passenger has no flying experience. When appropriate, the PIC can ask passengers to assist with certain tasks, such as watching for traffic or reading checklist items. [Figure 6-7]

A passenger can assist the PIC by:

- Providing information in an irregular situation, especially if familiar with flying. A strange smell or sound may alert a passenger to a potential problem.
- Confirming after the pilot that the landing gear is down.
- Learning to look at the altimeter for a given altitude in a descent.
- Listening to logic or lack of logic.

Also, the process of a verbal briefing (which can happen whether or not passengers are aboard) can help the PIC in the decision-making process. For example, assume a pilot provides his passenger a briefing of the forecasted landing weather before departure. When the Automatic Terminal Information Service (ATIS) is picked up at the destination and the weather has significantly changed, the integration of this report and forecasted weather causes the pilot to explain to a passenger the significance or insignificance of the disparity. The pilot must provide a cohesive analysis and explanation that is understood by the passenger. Telling passengers everything is okay when the weather is ¼ mile away is not fooling anyone. Therefore, the integration of briefing passengers is of great value in giving them a better understanding of a situation. Other valuable internal resources include ingenuity, solid aviation knowledge, and flying skill.

When flying alone, another internal resource is verbal communication. It has been established that verbal communication reinforces an activity; touching an object while communicating further enhances the probability an





**Figure 6-7.** When possible, have a passenger reconfirm that critical tasks are completed.

activity has been accomplished. For this reason, many solo pilots read the checklist out loud; when they reach critical items, they touch the switch or control. For example, to ascertain the landing gear is down, the pilot can read the checklist and hold the gear handle down until there are three green lights. This tactile process of verbally communicating coupled with a physical action are most beneficial.

It is necessary for a pilot to have a thorough understanding of all the equipment and systems in the aircraft being flown. Lack of knowledge, such as knowing if the oil pressure gauge is direct reading or uses a sensor, is the difference between making a wise decision or poor one that leads to a tragic error.

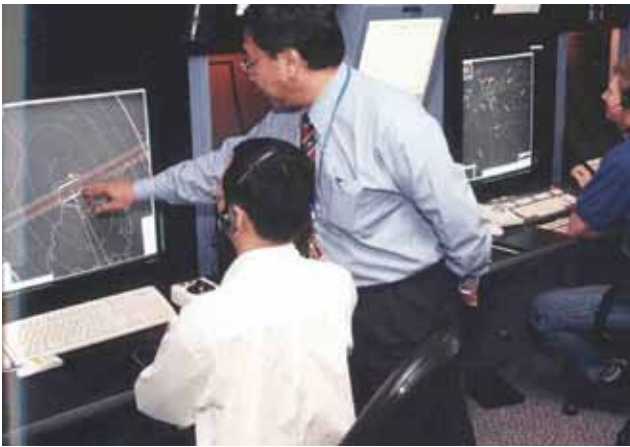
Checklists are essential flight deck internal resources. They are used to verify that aircraft instruments and systems are checked, set, and operating properly. They also ensure the proper procedures are performed if there is a system malfunction or inflight emergency. Students reluctant to use checklists can be reminded that pilots at all levels of experience refer to checklists, and that the more advanced the aircraft is, the more crucial checklists become. In addition, the pilot's operating handbook (POH) is required to be carried on board the aircraft and is essential for accurate flight planning and resolving inflight equipment malfunctions. However, the ability to manage workload is the most valuable resource a pilot has. [Figure 6-8]



**Figure 6-8.** The pilot must continually juggle various facets of flight, which can become overwhelming. The ability to prioritize, manage inflight challenges, and digest information makes the pilot a better professional.

## External Resources

Air traffic controllers and AFSS are the best external resources during flight. In order to promote the safe, orderly flow of air traffic around airports and along flight routes, the ATC provides pilots with traffic advisories, radar vectors, and assistance in emergency situations. Although it is the PIC's responsibility to make the flight as safe as possible, a pilot with a problem can request assistance from ATC. [Figure 6-9] For example, if a pilot needs to level off, be given a vector, or decrease speed, ATC assists and becomes integrated as part of the crew. The services provided by ATC can not only decrease pilot workload, but also help pilots make informed inflight decisions.



**Figure 6-9.** Controllers work to make flights as safe as possible.

The AFSS are air traffic facilities that provide pilot briefing, en route communications, VFR search and rescue services, assist lost aircraft and aircraft in emergency situations, relay ATC clearances, originate Notices to Airmen (NOTAM), broadcast aviation weather and National Airspace System (NAS) information, receive and process IFR flight plans, and monitor navigational aids (NAVAIDs). In addition, at selected locations, AFSS provide En Route Flight Advisory Service (Flight Watch), issue airport advisories, and advise Customs and Immigration of transborder flights. Selected AFSS in Alaska also provide Transcribed Weather En Route Broadcast (TWEB) recordings and take weather observations.

Another external resource available to pilots is the very high frequency (VHF) Direction Finder (VHF/DF). This is one of the common systems that helps pilots without their awareness of its operation. FAA facilities that provide VHF/DF service are identified in the airport/facility directory (A/FD). DF equipment has long been used to locate lost aircraft and to guide aircraft to areas of good weather or to airports. DF instrument approaches may be given to aircraft in a distress or urgent condition.

Experience has shown that most emergencies requiring DF assistance involve pilots with little flight experience. With this in mind, DF approach procedures provide maximum flight stability in the approach by using small turns and wings-level descents. The DF specialist gives the pilot headings to fly and tells the pilot when to begin a descent. If followed, the headings lead the aircraft to a predetermined point such as the DF station or an airport. To become familiar with the procedures and other benefits of DF, pilots are urged to request practice DF guidance and approaches in VFR weather conditions.

## SRM and the 5P Check

SRM is about how to gather information, analyze it, and make decisions. Learning how to identify problems, analyze the information, and make informed and timely decisions is not as straightforward as the training involved in learning specific maneuvers. Learning how to judge a situation and “how to think” in the endless variety of situations encountered while flying out in the “real world” is more difficult.

There is no one right answer in ADM, rather each pilot is expected to analyze each situation in light of experience level, personal minimums, and current physical and mental readiness level, and make his or her own decision.

SRM sounds good on paper, but it requires a way for pilots to understand and use it in their daily flights. One practical application is called the Five Ps (5 Ps). [Figure 6-10] The 5 Ps are:

- Plan
- Plane
- Pilot
- Passengers
- Programming

Each of these areas consists of a set of challenges and opportunities that face a single pilot. Each can substantially increase or decrease the risk of successfully completing the flight based on the pilot's ability to make informed and timely decisions. The 5 Ps are used to evaluate the pilot's current situation at key decision points during the flight or when an emergency arises. These decision points include preflight, pretakeoff, hourly or at the midpoint of the flight, predescent, and just prior to the final approach fix or for VFR operations, just prior to entering the traffic pattern.





**Figure 6-10.** *The 5 Ps.*

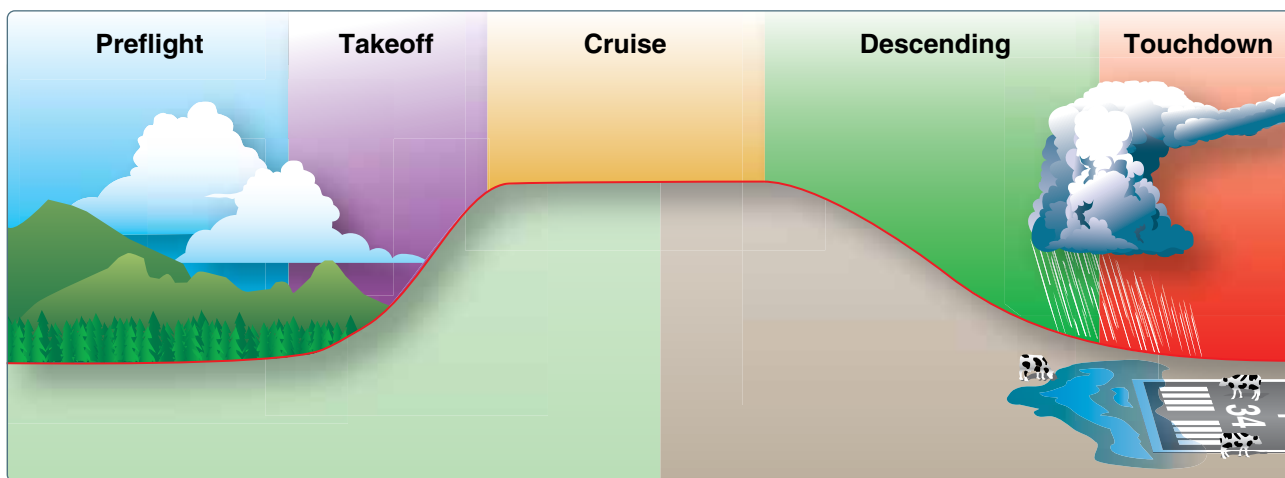
The 5 Ps are based on the idea that the pilots have essentially five variables that impact their environment and can cause the pilot to make a single critical decision or several less critical decisions that when added together can create a critical outcome. This concept stems from the belief that current decision-making models tended to be reactionary in nature. A change has to occur and be detected to drive a risk management decision by the pilot. For instance, many pilots use risk management sheets that are filled out by the pilot prior to takeoff. These form a catalog of risks that may be encountered that day and turn them into numerical values. If the total exceeds a certain level, the flight is altered or cancelled. Informal research shows that while these are useful documents for teaching risk factors, they are almost never used outside of formal training programs. The 5P concept is an attempt to take the information contained in those sheets and in other available models and put it to good use.

The first decision is whether to go or not to go on the flight, and the easiest point at which to cancel due to bad weather is the evening before the scheduled flight. A good pilot always watches the weather and checks weather information sources to stay abreast of current conditions and forecasts. This enables him or her to warn passengers that the weather conditions are questionable and they might need a backup plan. The subsequent visit to the flight planning room (or call to AFSS) provides all the information readily available to make a sound decision, and is where communication and Fixed Base Operator (FBO) services are readily available to make alternate travel plans. [Figures 6-11 and 6-12]

For instance, the easiest point to cancel a flight due to bad weather is before the pilot and passengers walk out the door and load the aircraft. So, the first decision point is preflight in the flight planning room.



**Figure 6-12.** *The first decision point is during the preflight planning.*



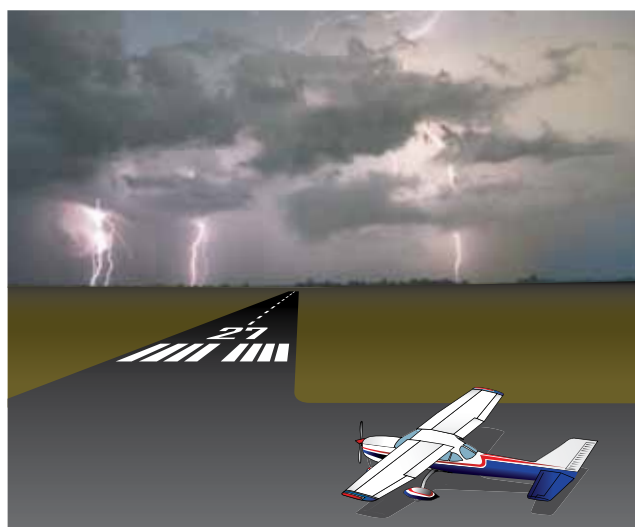
**Figure 6-11.** *The 5Ps are applied to various modes prior to and during the flight.*

The second easiest point in the flight to make a critical safety decision is just prior to takeoff. Few pilots have ever had to make an emergency takeoff. While the point of the 5P check is to help the pilot fly, the correct application of the 5 Ps before takeoff is to assist in making a reasoned go/no-go decision based on all the information available. The decision is usually to go with certain restrictions and changes but may also be a no-go. The key fact is that these two points in the process of flying are critical go/no-go points on each and every flight. [Figure 6-13]



**Figure 6-13.** This is a good time to assess self and fatigue. Are you running late? Have you checked the destination weather yet? Remember that when things are going wrong, they do not get better with time.

The third point at which to review the 5 Ps is the midpoint of the flight. [Figure 6-14] Pilots often wait until the ATIS is in range to check weather, yet at this point in the flight many good options have already been passed. Additionally, fatigue and low altitude hypoxia serve to rob the pilot of



**Figure 6-14.** The second point in applying the 5P check is just before takeoff.

much of his or her energy by the end of a long and tiring flight day. Fatigue affects memory, attention to detail, and communication ability. Frequently associated with pilot error, it also impairs coordination and degrades situational awareness, seriously influencing a pilot's ability to make effective decisions. There are several types of fatigue. Physical fatigue results from sleep loss, exercise, or physical work while factors such as stress and prolonged performance of cognitive work result in mental fatigue.

Hypoxia or oxygen starvation also robs a pilot of physical and mental acuity. Oxygen deprivation is insidious because it sneaks up on the unwary and steals the first line of sensory protection, the sense that something is wrong. The human body does not give reliable signals at the onset of hypoxia so a pilot needs special training in how to recognize the symptoms. This training is important because the brain is the first part of the body to reflect a diminished oxygen supply and evidence of that is usually a loss of judgment.

Everyone's response to hypoxia varies, but the effects of hypoxia can be safely experienced under professional supervision at the Civil Aeromedical Institute's altitude chamber in Oklahoma City and at 14 cooperating military installations throughout the United States. To attend a 1-day physiological training course, contact the FAA Accident Prevention Specialist for an Aeronautical Center (AC) Form 3150-7.

Once a pilot begins to suffer a loss of energy, he or she transitions from a decision-making mode to an acceptance mode. If the flight is longer than 2 hours, the 5P check should be conducted hourly. This is also a good time to evaluate the destination airport. Believe it or not many pilots have more problems on the ground taxiing than on the approach. Because larger airports have taxiways designed for large transport aircraft, the vantage point for a 767 crew sitting 18 feet off the ground regarding taxiways (especially at night) is superior to that for a pilot of a Cessna 172 with a vantage point at 6 feet. Therefore, at the midpoint of the flight, the pilot should review the layout, approaches, and the taxiway structure and its identification system. For instance, at Atlanta Hartsfield, a pilot is expected to understand the difference between "inner and outer M" (Mike) taxiway, and at Dulles a pilot is expected to know where "spot two" is located. Landing is not the time to review the airport facility. Conversely, if a pilot does not know the idiosyncrasies of the airport, requesting progressive instructions and/or letting ATC know he or she is "not familiar" reflects professionalism.

The last two decision points are just prior to descent into the terminal area and just prior to the final approach fix, or if VFR just prior to entering the traffic pattern, as preparations for landing commence. Most pilots execute approaches with

the expectation that they will land out of the approach every time. A healthier approach requires the pilot to assume that changing conditions (the 5 Ps) will cause the pilot to divert or execute the missed approach on every approach. This keeps the pilot alert to conditions that may increase risk and threaten the safe conduct of the flight. Diverting from cruise altitude saves fuel, allows unhurried use of the autopilot, and is less reactive in nature. Diverting from the final approach fix, while more difficult, still allows the pilot to plan and coordinate better rather than executing a futile missed approach. A detailed discussion of each of the 5 Ps follows.

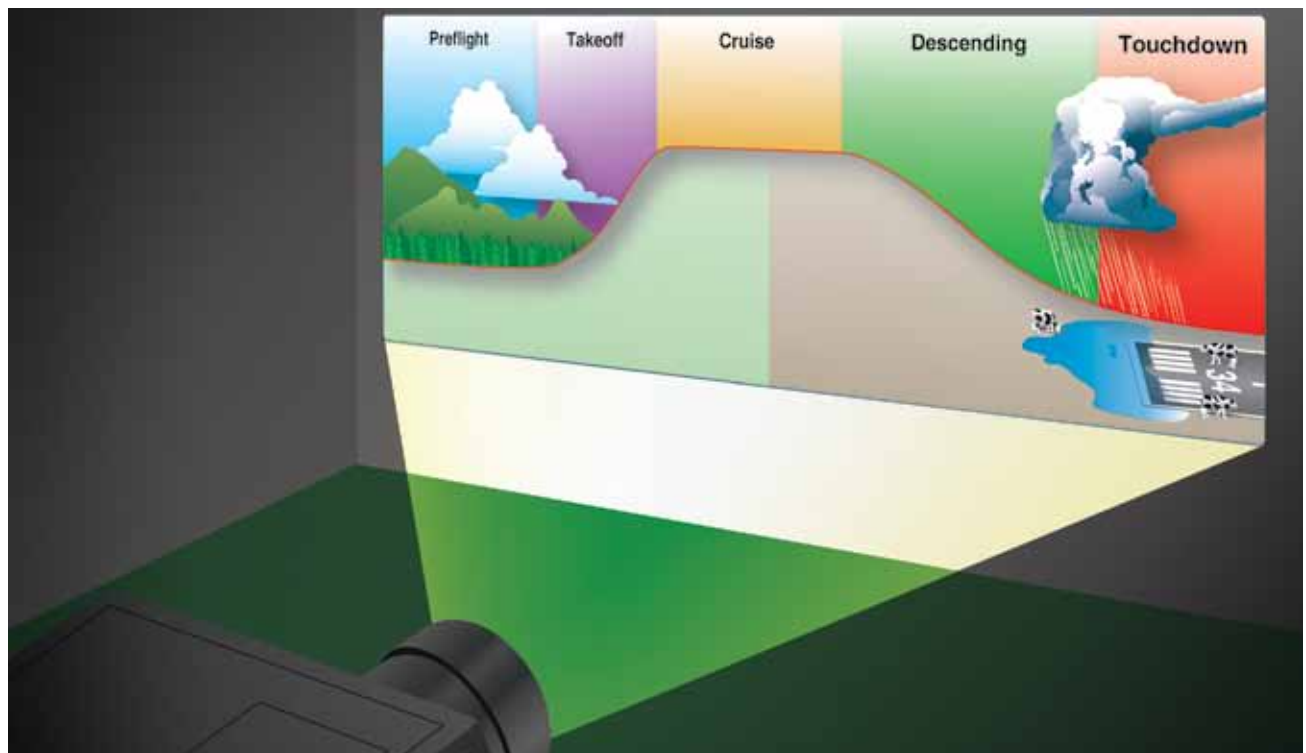
## Plan

The plan can also be called the mission or the task. It contains the basic elements of cross-country planning: weather, route, fuel, current publications, etc. The plan should be reviewed and updated several times during the course of the flight. [Figure 6-15] A delayed takeoff due to maintenance, fast-moving weather, and a short-notice temporary flight restriction (TFR) may all radically alter the plan. The plan is not only about the flight plan, but also all the events that surround the flight and allow the pilot to accomplish the mission. The plan is always being updated and modified and is especially responsive to changes in the other four remaining Ps. If for no other reason, the 5P check reminds the pilot that the day's flight plan is real life and subject to change at any time.

Obviously, weather is a huge part of any plan. The addition of real time data link weather information provided by advanced avionics gives the pilot a real advantage in inclement weather, but only if the pilot is trained to retrieve and evaluate the weather in real time without sacrificing situational awareness. And of course, weather information should drive a decision, even if that decision is to continue on the current plan. Pilots of aircraft without datalink weather should get updated weather in flight through an AFSS and/or Flight Watch.

## Plane

Both the plan and the plane are fairly familiar to most pilots. The plane consists of the usual array of mechanical and cosmetic issues that every aircraft pilot, owner, or operator can identify. [Figure 6-16] With the advent of advanced avionics, the plane has expanded to include database currency, automation status, and emergency backup systems that were unknown a few years ago. Much has been written about single-pilot IFR flight both with and without an autopilot. While use of autopilot is a personal decision, it is just that—a decision. Low IFR in a non-autopilot equipped aircraft may depend on several of the other Ps to be discussed. Pilot proficiency, currency, and fatigue are among them.



**Figure 6-15.** Using the 5P process does not end with the takeoff. It needs to be integrated into routine workmanship.





**Figure 6-16.** The plane consists of not only the normal mechanical components but also the many advanced systems and software that supports it.

## Pilot

Flying, especially when used for business transportation, can expose the pilot to high altitude flying, long distance and endurance, and more challenging weather. An advanced avionics aircraft, simply due to its advanced capabilities, can expose a pilot to even more of these stresses. The traditional “IMSAFE” checklist is a good start. [Figure 6-17]

The combination of late night, pilot fatigue, and the effects of sustained flight above 5,000 feet may cause pilots to become less discerning, less critical of information, less decisive, and more compliant and accepting. Just as the most critical portion of the flight approaches (e.g., a night instrument approach in weather after a 4-hour flight), the pilot’s guard is down the most. The 5P process helps a pilot recognize the physiological situation at the end of the flight before takeoff and continues to update personal conditions as the flight progresses. Once risks are identified, the pilot is better equipped to make alternate plans that lessen the effects of these factors and provide a safer solution.

## Passengers

One of the key differences between CRM and SRM is the way passengers interact with the pilot. The pilot of a single-

✓ **I'M SAFE CHECKLIST**

**I**llness—Do I have any symptoms?

**M**edication—Have I been taking prescription or over-the-counter drugs?

**S**tress—Am I under psychological pressure from the job? Worried about financial matters, health problems, or family discord?

**A**lcohol—Have I been drinking within 8 hours? Within 24 hours?

**F**atigue—Am I tired and not adequately rested?

**E**motion—Am I emotionally upset?

**Figure 6-17.** Making sure a pilot is ready to perform to a high standard is as important as the aircraft—maybe more!

engine aircraft enters into a very personal relationship with the passengers. In fact, the pilot and passengers sit within arm's reach all of the time. [Figure 6-18]



**Figure 6-18.** Passengers can be used effectively within the flight deck; simple things such as keeping an eye out for other aircraft is invaluable.

If the capabilities of a passenger sitting next to the pilot are not being utilized, the pilot is limiting the potential for a successful flight. Passengers can read checklists, verify PIC performance of an action, re-verify that the gear is down and the lights are on, look for other aircraft, and even tune radios. The failure of a pilot to integrate the passenger at some level of assistance is almost as bad as not utilizing a pilot in that seat. Another person onboard is a resource for the PIC to use. A bonus is heightened passenger appreciation for GA through the participation in the flight.

Sometimes passengers also have their own priorities that influence the PIC. The desire of the passengers to make airline connections or important business meetings easily enters into a pilot's decision-making loop. Done in a healthy and open way, this can be a positive factor. Consider a flight to Dulles Airport and the passengers, both close friends and business partners, need to get to Washington, D.C., for an important meeting. The weather is VFR all the way to southern Virginia then turns to low IFR as the pilot approaches Dulles. A pilot employing the 5P approach might consider reserving a rental car at an airport in northern North Carolina or southern Virginia to coincide with a refueling stop. Thus, the passengers have a way to get to Washington, and the pilot has an alternate plan to avoid being pressured into continuing the flight if the conditions do not improve.

Passengers can also be pilots. If no one is designated as pilot in command (PIC) and unplanned circumstances arise, the decision-making styles of several self-confident pilots may

come into conflict. Pilots also need to understand that non-pilots may not understand the level of risk involved in the flight. There is an element of risk in every flight. That is why SRM calls it risk management, not risk elimination. While a pilot may feel comfortable with the risk present in a night IFR flight, the passengers may not. A pilot employing SRM should ensure the passengers are involved in the decision-making and given tasks and duties to keep them busy and involved. If, upon a factual description of the risks present, the passengers decide to buy an airline ticket or rent a car, then a good decision has generally been made. This discussion also allows the pilot to move past what he or she thinks the passengers want to do and find out what they actually want to do. This removes self-induced pressure from the pilot.

## Programming

The advanced avionics aircraft adds an entirely new dimension to the way GA aircraft are flown. The electronic instrument displays, GPS, and autopilot reduce pilot workload and increase pilot situational awareness. [Figure 16-19] While programming and operation of these devices are fairly simple and straightforward unlike the analog instruments they replace, they tend to capture the pilot's attention and hold it for long periods of time. To avoid this phenomenon, the pilot should plan in advance when and where the programming for approaches, route changes, and airport information gathering should be accomplished, as well as times it should not. Pilot familiarity with the equipment, the route, the local air traffic control environment, and personal capabilities vis-à-vis the automation should drive when, where, and how the automation is programmed and used.



**Figure 6-19.** Understanding automation requires not just familiarization with the concepts but thorough understanding of the different systems.

The pilot should also consider what his or her capabilities are in response to last minute changes of the approach (and the reprogramming required) and ability to make large-scale changes (a reroute for instance) while hand flying the aircraft. Since formats are not standardized, simply moving from one manufacturer's equipment to another should give the pilot pause and require more conservative planning and decisions.

## Chapter Summary

The SRM process is simple. At least five times before and during the flight, the pilot should review and consider the plan, plane, pilot, passengers, and programming and make the appropriate decision required by the current situation. It is often said that failure to make a decision is a decision. Under SRM and the 5 Ps, even the decision to make no changes to the current plan is made through a careful consideration of all the risk factors present.